

1 HOLLOW STRUCTURAL MEMBER

5 Your Petitioner, MARK J. PERINA, a citizen of the United States and a resident of the State of Nebraska, whose post office address is 2206 South 115th Street, Omaha, Nebraska 68144, prays that Letters Patent may be granted to him for the invention set forth in the following specification:

10 BACKGROUND OF THE INVENTION

15 1. FIELD OF THE INVENTION

This invention relates to a hollow structural member such as a wind turbine tower or the like.

20 2. DESCRIPTION OF THE RELATED ART

Wind turbines are becoming more popular in the production of electrical energy. The wind turbine normally comprises a rotor-driven generator mounted atop a tower which may reach heights of 70 meters or more.

25 In assignee's U.S. Patent Nos. 6,278,198; 6,505,785; and 6,522,025, a wind turbine is shown to be mounted on the upper end of a tubular tower comprised of tubular pole sections secured to one another in an end-to-end fashion. Each of the pole sections in assignee's prior wind turbine towers is comprised of a single sheet of steel material which is bent and welded together to form a cylindrical or tubular pole section. Because the individual pole sections are fabricated at a factory remote from the job site, the pole sections are either welded to one another at the factory or are welded together at the job site. In either case, the pole sections or the assembled pole

1 must be shipped to the job site and the size of the pole sections and pole make the  
transportation task somewhat difficult.

#### SUMMARY OF THE INVENTION

5 A hollow, elongated structural member such as a wind turbine tower is disclosed with the wind turbine tower being comprised of a plurality of elongated hollow pole sections secured together in an end-to-end relationship. Each of the hollow pole sections comprises a plurality of longitudinally extending peripheral sections joined together. Each of the peripheral sections is bent along a plurality of 10 longitudinally extending break lines to define a plurality of angled wall sections extending between inwardly extending edge portions. The peripheral sections may be shipped from the factory to the job site and assembled at the job site to form the hollow pole sections. The edge portions of the peripheral sections are bolted together to form a hollow pole section. The peripheral sections are bolted together from within 15 the hollow pole section.

It is therefore a principal object of the invention to provide an improved structural member of the type described.

A further object of the invention is to provide an improved wind turbine tower.

20 Still another object of the invention is to provide a wind turbine tower which is comprised of a plurality of hollow pole sections joined together in an end-to-end relationship with each of the pole sections being comprised of a plurality of peripheral sections bolted together.

1 Still another object of the invention is to provide a wind turbine tower of the type  
described wherein the peripheral sections are joined together by bolt members from  
within the interior of the pole section.

5 Yet another object of the invention is to provide a wind turbine tower of the type  
described which eliminates the need for guide rails to be secured to the exterior  
surface of the tower.

These and other objects will be apparent to those skilled in the art.

#### BRIEF DESCRIPTION OF THE DRAWINGS

10 Figure 1 is a side view of the wind turbine tower of this invention;

Figure 2 is a front view of the wind turbine tower of this invention;

15 Figure 3 is a partial perspective view of the hollow structural member of this  
invention;

Figure 4 is a plan elevational view of a flat sheet member which is bent or  
15 broken to form a peripheral section of a pole section;

Figure 5 is an end view of a peripheral section of a pole section;

Figure 6 is a perspective view of a peripheral section;

Figure 7 is a partial perspective view of one of the pole sections;

20 Figure 8 is an end view of one of the pole sections; and

Figure 9 is a view similar to Figure 8 except that internal bracing is shown.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

25 The numeral 10 refers to a hollow, elongated structural member such as a wind  
turbine tower as illustrated in assignee's U.S. Patent Nos. 6,278,198; 6,505,785 and

1 6,522,025. In the wind turbine towers of U.S. Patent Nos. 6,278,198; 6,505,785 and  
6,522,025, guide rails are provided on the exterior surface of the tower to enable a  
wind turbine support or sled to move along the length of the tower. The instant  
invention eliminates the need for rails, as will be described hereinafter.

5 Tower 10 is constructed with a plurality of elongated hollow metal pole sections  
12 which are secured together in an end-to-end relationship by splice plate assemblies  
14, such as described in assignee's pending patent application Serial No. 10/463,155,  
filed June 17, 2003, entitled A TWO-PLATE SPLICE CONNECTION ASSEMBLY. The  
10 pole sections 12 may be tapered or non-tapered as desired.

15 Each of the pole sections 12 is constructed of a plurality of longitudinally  
extending peripheral sections 16, preferably three (Figure 3). Each section 16 is  
formed or bent from a flat sheet 18 having side edges 20 and 22, upper edge 24 and  
lower edge 26 (Figure 4). In one embodiment, the sheet 18 preferably has a width of  
116.50 inches and a height of 472 inches. If the wind tower is tapered, the width of the  
upper edge 24 will be less than the width of the lower end 26. A plurality of bolt  
openings 28 are formed in sheet 18 adjacent side edge 20 and a plurality of bolt  
openings 30 are formed in sheet 18 adjacent side edge 22. The sheet 18 is bent or  
20 broken along break lines 32, 34, 36, 38, 40, 42 and 44 to create the configuration seen  
in Figure 5. As seen in Figure 5, the break lines are radiused.

25 The break lines form edge portions 46 and 48, and angled wall sections 50, 52,  
54, 56, 58 and 60. Edge portions 46 and 48 have the same width. Wall sections 50  
and 60 have the same width. Walls sections 52 and 58 have the same width. Wall

1 sections 54 and 56 have the same width. The width of wall sections 50 and 60 is less  
than the width of wall sections 52 and 58. The width of wall sections 52 and 58 is less  
than the width of wall sections 54 and 56.

5 Once formed, the bent peripheral sections 18 may be shipped to the job site for  
assembly on site. At the job site, each of the pole sections 12 is assembled by joining  
three peripheral sections 16 together, as seen in Figure 3. The adjacent edge portions  
of the sections 16 are secured together from within the pole section by inserting bolts  
62 through the registering bolt openings 28 and 30. When assembled, the juncture of  
10 the peripheral sections 16 form generally V-shaped recesses 64 therebetween (Figure  
9) which may receive rollers or the like extending from a wind turbine support or sled  
which eliminates the need for securing guide rails to the exterior of the pole sections.  
Although the preferred embodiment utilizes three peripheral sections 16 for each pole  
15 section, the pole section could be comprised of more than three peripheral sections  
with those sections being modified as required.

If required, a plurality of vertically spaced-apart braces 66 may be secured to  
the edge portions of the peripheral sections, as seen in Figure 9. After the pole  
sections 12 have been assembled, the pole sections 12 are preferably secured  
20 together in an end-to-end relationship by means of splice plate assemblies 14,  
preferably of the design described in assignee's co-pending application Serial No.  
10/463,155 filed June 17, 2003, entitled A TWO-PLATE SPLICE CONNECTION  
25 ASSEMBLY.

1        It should be noted that the structural member could be comprised of three  
peripheral sections having five angled wall sections, five peripheral sections having  
four angled wall sections, four peripheral sections having seven angled wall sections,  
or any number or combination thereof.

5        It can therefore be seen that a novel hollow structural member such as a wind  
turbine tower has been provided wherein: (1) the individual peripheral sections 16  
may be shipped to the job site and then assembled into pole sections 12 or the  
peripheral sections 16 may be assembled at the factory and then shipped as pole  
10      sections 12 to the job site; (2) the peripheral sections 16 may be secured together  
from within the pole section; (3) the tower is structurally sound; and (4) the need for  
welding guide rails to the pole sections has been eliminated due to the provision of the  
V-shaped recesses 64.

15      Thus it can be seen that the invention accomplishes at least all of its stated  
objectives.

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